Montana Department of Transportation
PO Box 201001
Helena, MT 59620-1001

MEMORANDUM

To: See Distribution

From: Kevin Christensen, P.E.
Construction Engineer

Date: October 29, 2008

Subject: Supplemental Specification Revisions: Section 559, Piling (Revisions to 9 Subsections and 1 new Subsection)

The Construction Administration Services Bureau is proposing revisions to Section 559, Piling, following the Standard Specification Revision Process outlined in the Construction Engineer's Memorandum dated May 2008. The following information is provided.

1. Multiple Revisions to Section 559, Piling, will be modified.

2. The Proposed Drafts of the change is attached along with this memorandum.

3. Revisions to the Standard Specifications are needed to address changes in Piling measurement, and payment.

4. Those impacted by the change include:
   Construction, Contractors, EPM's

5. The following individuals were consulted and/or involved in developing the proposed revisions:
   CAS / CES Bureau, Bridge, MCA

*It is requested that written comments on **the proposed revisions only**, be returned to **mdtspecifications@mt.gov** no later than November 28, 2008.*

DISTRIBUTION:

Loran Frazier	Dist. Const. Engineers	MDT EPM's
Jim Walther	MDT Legal	FHWA
Eng. Bureau Chiefs	Construction Reviewers	MCA
District Administrators	Materials Lab Supervisors	

559.02.2 Furnish Pile

Furnish pile quantities shown in the contract.

The specified lengths are those required below cutoff. Adjust lengths for the difference between the cut off length and the pile position in the driving equipment and as necessary to meet the requirements of Subsection 559.02.5. Increase pile lengths 1.0 foot (300 mm) for steel pile. Remove and dispose of excess pile length after the pile is driven.

559.02.04 Splicing Piles

When directed by the Project Manager, splice piles driven to plan grade that do not obtain the required driving resistance and continue driving until the required capacity is obtained. Weld steel pile in accordance with AWS D1.5 requirements. Use 10-foot (3-meter) minimum spacing for steel pile splice welds. When steel piles are driven less than 10 feet (3 meters) below the cutoff elevation specified, use one splice to obtain the required cutoff elevation.

559.02.5 Holes in Piling

Pile segments with one drilled hole having a diameter of 7/8 inch (22 mm) or less in any cross-section may be incorporated into the finished structure. Pile with more than one hole in a cross-section, flame cut hole(s), or a hole greater than 7/8 inch (22 mm), must be cut off to remove the hole(s).This requirement does not apply to holes drilled for attaching dynamic testing equipment, holes shown in the plans or holes within 12 inches (305mm) of the cutoff elevation.

559.03.3 Pile Capacity

B. Compression Load Tests.

2. Dynamic Load Tests. If specified, perform dynamic load tests in accordance with ASTM D 4945 on pile designated for dynamic load tests. Use a pile specialty consultant with at least three years experience in dynamic load testing and analysis to perform the dynamic load test, Case Pile Wave Analysis Program (CAPWAP) and the wave equation analysis, including the initial wave equation analysis specified in Subsection 559.03.2. Use a Geotechnical Engineer licensed as a Professional Engineer in Montana who has achieved at least Advanced Level on the Foundation QA Examination for Providers of PDA Testing Services to perform the CAPWAP analysis. Use a technician with a Basic Level classification on the Foundation QA Examination for Providers of PDA Testing Services Operation to operate the Pile Driving Analyzer. Provide the specialty consultant on site during the dynamic load tests. Submit the specialty consultant's resume for approval.

Furnish digital data acquisition system equipment with a display screen and printer.

With dynamic testing equipment attached, drive the pile in one continuous operation to the design tip elevation, or deeper if directed by the Project Manager. The Project Manager may lower the required tip elevation based on the ultimate pile capacity measurements at the time of driving or re-driving. Reduce the driving energy to the pile to maintain pile stresses below the values specified in Subsection 559.03.3(A)(2), using additional cushions or reduction of the hammer's output energy. If eccentric driving is indicated, immediately re-align the driving system. Provide a

Deleted: Perform dynamic load tests in accordance with ASTM D 4945 on the pile designated for dynamic load tests.

printed summary of the dynamic load test results and recommendations for service pile driving criteria (blow count and stroke) and pile tip elevation. The Project Manager will determine the service pile driving criteria and minimum pile tip elevations based on the dynamic load test results and specialty consultant's recommendations.

Perform a re-drive of the test pile when required by the Project Manager. After initial driving, wait the minimum time specified, then re-drive each dynamic load test pile with the instruments attached. Apply at least 20 resistance blows to warm the hammer before re-driving. Do not warm the hammer using the dynamic load test pile. Re-drive the dynamic load test pile for a maximum penetration of 6 inches(150mm) or a maximum of 50 blows, whichever occurs first.

Verify the assumption used in the initial wave equation analysis submitted in Subsection 559.03.3(A)(1) using CAPWAP. Analyze one blow from the original driving and one blow from the re-driving for each pile tested.

Perform additional wave equation analysis with adjustments based on the CAPWAP results. Provide a graph showing blow count versus ultimate capacity. For open-ended diesel hammers, provide a blow count versus stroke graph for the ultimate capacity. Provide the driving stresses, transferred energy and pile capacity as a function of depth for each dynamic load test. Submit a written report with numerical and graphical results of the dynamic load testing, CAPWAP analysis and wave equation analysis.

559.03.5 Service Pile

Do not initiate driving of the service piles until all test piles and analysis are complete unless authorized by the Project Manager. Drive the pile to the design tip elevation shown on the plans, or deeper if necessary and to achieve the ultimate pile capacity during driving shown on the plans. If specified, establish pile tip elevation and ultimate pile capacity by compression load testing or dynamic load testing.

Deleted: service

Deleted: specified pile

Furnish the service pile lengths specified in the contract. Adjust pile lengths for the difference between cutoff length and the pile position in the driving equipment.

The Project Manager will observe the pile driving and calculate the predicted pile capacity as it is being driven.

When a re-drive of the service pile is required, re-drive the pile not less than 24 hours or more than 72 hours after initial driving and do not drive the pile below cut off elevation. If the Project Manager determines pile stresses during driving are damaging the pile, the Department may require other installation methods or equipment to obtain pile penetration.

Correct or replace improperly driven, damaged or defective pile at Contractor's expense.

Temporary welded plates for aligning field splices or hoisting may be used with the Project Manager's approval. Remove temporary plates and grind welds smooth.

559.03.7 Steel Pipe Pile

Securely cover driven pipe piling to prevent open-hole hazards during non-working hours.

Remove water in steel pipe piles before placing concrete or place the concrete using a tremie when water is present in the pile.

Provide lighting to illuminate the full pile length when requested to aid inspection of the pile before placing concrete. Fill steel pipe piles to an elevation no less than 2 feet (600 mm) below

the cut off elevation with Class "DD" Portland cement concrete a minimum of 12 hours prior to pouring the cap.

Do not place concrete in pipe piles until all piles for the bent have been driven.

Deleted: ¶
Furnish pile is measured by the foot (meter).

559.04.1 Load Tests

Static and dynamic load tests, and test pile re-drives, completed and accepted are measured by the unit. Include all materials, tools, standby time, and equipment required to perform each test or test pile re-drive in the unit bid price for the item. Furnishing, driving, splices, re-driving of service piles and pile end protection are measured for payment as outlined in other Subsections. Do not include these costs in the static and dynamic load tests.

559.04.2 Furnish Pile

Furnish pile is measured by the foot (meter) based on the plan quantity.

Deleted: or the length between the pile tip and the cutoff elevation. Pile furnished in addition to the plan quantity is measured for payment.

559.05 BASIS OF PAYMENT

The Department will not pay for:

- Furnishing or driving falsework pile;
- Pile driven out of place and not accepted;
- Defective pile, or pile damaged in handling or driving;
- Forming holes or lengths of pile cut off according to Subsection 559.02; or
- Welding temporary plates, removing the plates and grinding the welds smooth.

Include payment for the costs associated with painting steel pile and steel pipe piles and filler concrete in the contract unit price per foot (meter) of drive pile.

Pile furnished, based on the plan quantities, but not incorporated in the finished structure, is paid for at the contract unit price per foot (meter) of furnish pile and becomes the property of the Contractor. Pile furnished in addition to plan quantity that is incorporated in the finished structure, is paid for by lump sum agreed price or under Subsection 109.04.2.

Deleted: at invoice price

Payment for the completed and accepted quantities is made under the following:

Pay Item	Pay Unit
Static Load Test	Each
Dynamic Load Test	Each
Furnish Pile	Foot (meter)
Drive Pile	Foot (meter)
Pile Pre-bore	Foot (meter)
Pile Drill and Socket	Foot (meter)
Pile Splice	Force Account
Pile Driving Point	Each
Pile Conical Driving Point	Each
Pile Cutting Shoe	Each
Re-drive Test Pile	Each
Re-drive of Service Pile	Force Account

Partial payments for drive pile will be made based on the total quantity as follows:

1. 95 percent when the piles are driven to final penetration.
2. 100 percent when the piles are cut off and painted as specified.

Payment at the contract unit price is full compensation for all resources necessary to complete the item of work under the contract.